

# THE TAXONOMIC STATUS OF *GILIA CAESPITOSA* (POLEMONIACEAE)

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## ABSTRACT

The status of the rare Utah endemic, *Gilia caespitosa* A. Gray (Polemoniaceae) was evaluated with respect to morphological and chromosomal data. The possession of a concolorous corolla with included to barely exerted anthers, zonocolporate, reticulate pollen and a chromosome number of  $2n = 16$  are a combination of characters which suggest a relationship to *G. subnuda* A. Gray and allies within sect. *Giliandra* A. Gray. However, the possession of a perennial habit, multicipital caudex and graduated entire leaves characterize *G. caespitosa* as a distinct taxon.

The binomial *Gilia caespitosa* A. Gray has had an interesting taxonomic history leading to temporary obscurity. Nelson (1898) elevated *Gilia pungens* Benth. var. *caespitosa* A. Gray (basonym = *Leptodactylon caespitosum* Nutt.) to specific status under *Gilia* and proposed *G. grayi* as a substitute for Gray's earlier name. Nelson's binomial represents a nomenclatural synonym. Brand (1907) apparently misinterpreted the adherence of fine sand grains to the glandular hairs as "calcareo-glandulosis", concluded that this was "abhorret" within Polemoniaceae and without further comment suggested an affinity to the Saxifragaceae. This treatment was later followed by Grant (1959). *Gilia caespitosa* was rediscovered through recent botanical studies in southcentral Utah and its status as a rare taxon was recently reviewed (Welsh et al., 1975). The apparent restriction of *Gilia caespitosa* to the vicinity of the type locality and a combination of morphological characters unique within *Gilia* provide the justification for this paper.

## METHODS

Flowers, seeds, and a voucher specimen were collected 1.6 km south of Teasdale, Wayne Co., UT, currently the only known locality for the species. Seeds were germinated for determination of chromosome number using the Feulgen technique. Pollen was removed from anthers, vapor-coated with gold and examined on a Hitachi HHS-2R SEM. Additional specimens of *Gilia caespitosa* and putatively related taxa were examined through the courtesy of COLO, CS, GH, NY, RM, RSA, UC, and UTC.

## RESULTS AND DISCUSSION

*Gilia caespitosa* was first collected by L. F. Ward in "Rabbit Valley, Utah" in 1875. Rabbit Valley includes the upper Fremont River drainage and the locality near Teasdale (Anonymous, 1952). Two specimens

of the Ward collection are at GH and are annotated in Gray's handwriting. However, both specimens lack corollas and well-developed fruits. One of these specimens clearly matches the protologue and includes the designation "*Gilia (Ipomopsis?) caespitosa* n. sp." Associated with the latter specimen is a note signed by Ward. The note includes the pertinent statements "corolla . . . is clearly monopetalous", "the ovary is 3-valved and 3-celled", and "I . . . believe the plant to belong to the Polemoniaceae." If Gray had any unpublished doubts regarding the taxonomic identity of the Ward collection, they were apparently dispelled by Ward's recorded observations, these being associated with the type collection.

The following treatment is presented as a more complete description of the taxon.

*GILIA CAESPITOSA* A. Gray, Proc. Amer. Acad. Arts 12:80. 1876.—*Gilia grayi* A. Nelson, Bull. Torrey Bot. Club 25:547. 1898. nom. superfl., illegit. (Substitute for *Gilia caespitosa* A. Gray).—TYPE: "Rabbit Valley, Utah, on barren cliffs of sandstone, at 7000 feet, L. F. Ward, in Powell's Expedition, 1875." (GH!).

Caespitose perennial, the underground woody caudex with few to numerous stems 4–30 cm tall. Basal and lower leaves densely crowded, spatulate to obovate, entire, 4–15 mm long, 2–4 mm wide, densely glandular-pubescent, in most specimens appearing grayish because of adherence by light-colored, fine sand. Upper leaves reduced, entire, lanceolate to narrowly spatulate, glandular, 3–6 mm long, to 2 mm wide. Flowers 1–5 in loose, cymose clusters. Pedicels 2–5 mm long. Calyx glandular-pubescent, 4–5 mm long at anthesis, lobes 1.5–2 mm long at anthesis, up to 3 mm in fruit, the tips minutely mucronate, the narrow sinuses hyaline. Corolla funnellform, red to pink throughout, the tube 9–17 mm long, lobes 4–6 mm long, 3–4 mm wide, the exterior surface of the lobes with glandular trichomes. Anthers included to barely exerted, these 8–12 mm above the base of the tube, filaments slightly unequally inserted. Style 9–11 mm long. Ovary with 1–2 ovules per locule, the mature fruit about 4 mm long. Seeds to 1 mm long, narrowly elliptical, angular and slightly mucilaginous when wet.

*Distribution.* Crevices and small outcrops of decomposing, white sandstone at the margin of a pinyon-juniper-sagebrush community at 2100–2600 m, 1.6 km south of Teasdale, Wayne Co., Utah. June–July.

Representative specimens: 10 June 1947, *Ripley & Barneby 8607* (NY, UTC); 23 June 1964, *Clark 4* (CS, UTC); 4 July 1965, *Holmgren 2138* (CS, NY, UTC); 7 July 1976, *Wilken 12,685* (CS).

The perennial habit, glandular vestiture, reduced upper leaves, and

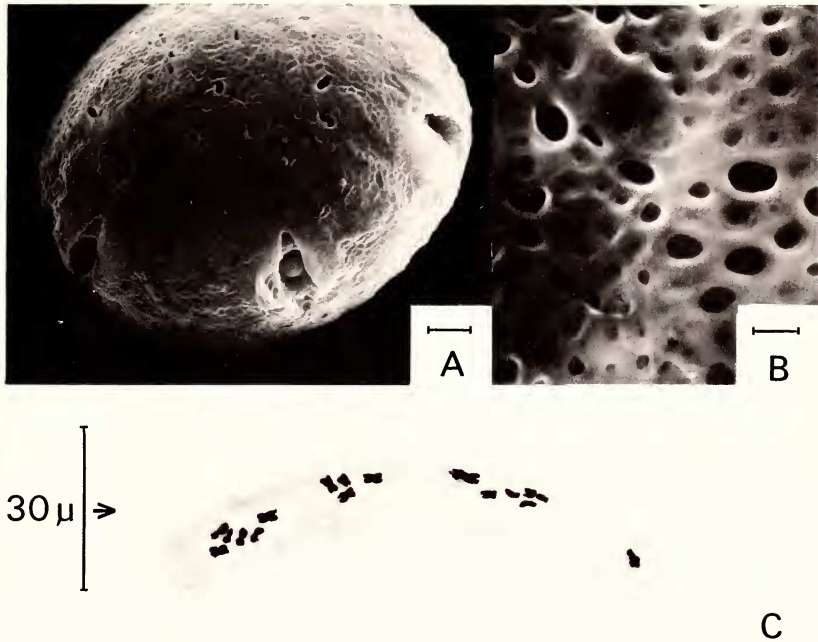


FIG. 1. Pollen grain morphology and chromosome number of *Gilia caespitosa*. A. Pollen grain. Bar = 4  $\mu$ m. B. Pollen grain. Bar = 2  $\mu$ m. C. Mitotic root-tip cell showing 16 chromosomes.

funnelform, concolorous corolla are a combination of characters found within sect. *Giliandra* Gray (Grant, 1959). Entire basal leaves are known in a number of annual taxa elsewhere in *Gilia* but are rare in perennial species of *Gilia*. I have seen entire leaves among some specimens of *G. pentstemonoides* Jones and the biennial *G. subnuda* Gray. Entire leaves were described in the otherwise poorly known *G. sedifolia* Brandege. The corollas of *G. pentstemonoides*, however, are blue with conspicuously exserted stamens. The reddish, concolorous corollas and included to barely exserted anthers of *G. caespitosa* also are found in *G. subnuda* and most if not all conspecific allies (i.e., *G. crandallii* Rydberg, *G. haydenii* Gray, *G. montezumae* Tidestrom & Dayton, *G. superba* Eastwood). Morphological differences between *G. caespitosa* and *G. subnuda* are summarized in Table 1.

Surveys of polemoniaceous pollen (Stuchlik, 1967; Taylor and Levin, 1975) offer the opportunity to examine relationships among *G. caespitosa* and putative relatives. The pollen grains of *G. caespitosa*

TABLE 1. MORPHOLOGICAL DIFFERENCES BETWEEN *Gilia caespitosa* AND *Gilia subnuda*. Character states given for *G. subnuda* generally apply to close if not conspecific allies, including *G. crandallii*, *G. haydenii*, *G. montezumae*, and *G. superba*. Similarities among these taxa are discussed in the text.

Character	<i>G. caespitosa</i>	<i>G. subnuda</i>
Habit	perennial	annual to biennial, monocarpic
Caudex	multicipital from a woody base	1 to few from the basal rosette
Leaves	gradually reduced above the basal rosette	abruptly reduced above the conspicuous basal rosette
Leaf Margin	lower and upper leaves entire	lower leaves pinnatifid to rarely entire; upper leaves entire

(Fig. 1A, 1B) are zonocolporate with (4)5(6) slightly sunken colps and an oblate spheroidal shape (polar diam. 42–49  $\mu\text{m}$ ; equatorial diam. 46–54  $\mu\text{m}$ ). The exine is 2–3  $\mu\text{m}$  thick and the sexine is reticulate with muri to 2  $\mu\text{m}$  wide. Most *Gilia* pollen grains are zonocolporate with either striato-reticulate or pertectate sexines. A zonocolporate, reticulate pollen was described only for *G. subnuda* (Stuchlik, 1967).

Root tip preparations of *G. caespitosa* revealed a chromosome number of  $2n = 16$  (Fig. 1C). Within *Gilia* this chromosome number has been reported for only four taxa, all of these being in sect. *Giliandra*: *G. micromeria* A. Gray, *G. pentstemonoides* Jones, *G. pinnatifida* Nuttall, and *G. subnuda* A. Gray (Grant, 1959).

A consideration of chromosome number and floral, vegetative, and pollen morphology strongly indicates a relationship among *G. caespitosa* and taxa within sect. *Giliandra*, particularly *G. subnuda* and its allies. This relationship was first suggested without explanation by Gray (1886) whereas Rydberg (1917), emphasizing the perennial habit, implied a relationship among *G. caespitosa*, *G. pentstemonoides*, and *G. sedifolia*. However, with a perennial habit, multicipital caudex, and graduated, entire leaves, *G. caespitosa* clearly represents a well-defined taxon and may represent one of the more primitive elements within sect. *Giliandra*. The significance of this species to future studies of systematic relationships within sect. *Giliandra* and the intricate phylogenetic patterns within *Gilia* provide a strong argument for protection of *G. caespitosa*.

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